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22 August 2023

Attention: Brendan Price
The Dott Developments Pty Ltd
Level 6 161 London Circuit
Canberra ACT 2601
brendan@thepricegroup.com.au
BY EMAIL

Dear Brendan

Re: Land Capability Assessment – 37 Annie Pyers Drive Gundagai NSW 2722

I refer to the written request by yourself to conduct a Land Capability Assessment (LCA) for a proposed commercial development at 37 Annie Pyers Drive, Gundagai NSW 2722, the site. The intended recipient of this report is yourself for use in the design of a wastewater management system. It is assumed that designers, installers, and regulators will rely on this report for guidance, however DM McMahon Pty Ltd is required to be consulted when designs are being prepared to confirm site conditions in relation to the site-specific development.

Objective and scope

The objective of this LCA is to adopt the approaches outlined in AS 1547 (2017) On-site Domestic Wastewater Management and the NSW Department of Environment and Conservation (DEC 2004) Use of Effluent by Irrigation, to achieve sustainable and effective wastewater management and to protect public health and the environment. AS 1547 (2017) and DEC (2004) have been adopted to provide a clear and consistent approach to conduct LCAs and has been used in preference to other guidelines owing to its relevance and state wide acceptance. Our role is designated as a site evaluator and assessor to evaluate the capacity of a site and its soil for accepting treated wastewater and to provide recommendations for alternate management methods if required.

The agreed scope of works include:

- Where available, review plans and other general related documents provided to us to gain a comprehensive understanding of the site.
- Undertake a site and soil check of the proposed land application area as instructed on by yourself to collate relevant site information and environmental factors.
- Conduct a site and soil assessment to examine and record the soil profile and soil features within the proposed application area.
- Detail the results of the assessment of the area for environmental factors (setbacks and constraints) which are likely to impinge on the siting and design of a land application system; and evaluate the site and soil characteristics to determine feasible options for designing and sizing a land application system and alternate management methods if required.

Location and description of the project site and its history

The site is a 2.7ha (approx.) land parcel with a real property description of Lot 2 DP 160191 and Lot 529B DP 203601 and is located on the western side of Annie Pyers Drive off the Hume Highway approximately 8km north of Gundagai. Location maps and a plan of the proposed development can be seen in **Attachment A**.

From a historical search and review of the available historical aerial imagery, Annie Pyers established a kiosk/retail outlet on site in 1933 (the Dog on the Tuckerbox). The current kiosk/retail outlet and disused service station building, were built sometime in the 1960s and 1970s with the older buildings mostly removed.

Annie Pyers Drive is not connected to municipal sewer, so on-site wastewater management is required. Water is supplied from bore water and rainwater currently, but we understand that Council is currently undertaking or will be undertaking works in the near future to connect the site to a reticulated town water supply. Currently the site is occupied by a 300m^2 kiosk/retail outlet with toilet facilities and a disused service station building. Wastewater is currently disposed of on site by a trench system. The proposal is to demolish the existing kiosk/retail outlet and disused service station building and replace them with a bakery/café and a restaurant with a floor area of 252m^2 and 253m^2 respectively.

Description of the regional and local environment

The site lies on a north east trending very gently inclined footslope of Silurian sedimentary rocks and Quaternary alluvium at elevation of around 262 to 257 mAHD.

The site lies within a local Five Mile Creek catchment with the Five Mile Creek, a third order intermittent, located around 90m down gradient of the site boundary and an unnamed third order ephemeral drainage located around 40m upgradient of the site boundary. These drainages have integrated and convergent channel network with the confluence with the Murrumbidgee River being around 2km downgradient of the site.

There are no registered bores on site but there are four bores on neighbouring property. Two bores at a similar elevation to the site are constructed to around 10m deep into the underlying alluvium with groundwater intersected at around 7m, while the two upgradient bores are 22m and 30m deep and the construction is unknown but assumed to be into the underlying fractured sedimentary rock. These four bores are registered for stock and domestic use. Interflow and throughflow will occur in the surficial soil after periods of extended wet weather. Anecdotally, we understand that there have been concerns in the past with potential contamination of interflow and groundwater during periods of high rainfall resulting from a wastewater management system on a nearby site.

The climate for Gundagai is characterised as having hot dry summers and cool winters. The average annual rainfall for the site is around 700mm per annum with wetter than average months being from June through to October. The annual pan evaporation for the site is around 1400mm with rainfall exceeding evaporation in the cooler months from May to August.

Records of fieldwork, including methods and results

McMahon conducted a site and soil assessment and found that soils on site have a strong relationship with the slope sequence, which are characterised by deep reddish clayey residual soil on the high elevations, deep brownish clay loam colluvial and residual soil on the mid elevations, and deep dark brown clay loam alluvial soil on the low elevations. A map of the investigation locations can be seen in **Attachment B** and the log sheets with soil descriptions and field test results can be seen in **Attachment C**.

Laboratory results

Bulk grab samples were taken from the topsoil and subsoil within the proposed land application area. These samples were laboratory tested for the chemical parameters pH ($CaCl_2$), electrical conductivity, and exchangeable cations. The results found a slightly acid, non-saline, non-sodic topsoil overlying a slightly acid, non-saline, non-sodic subsoil. The chemical analysis results can be seen in **Attachment D**.

Summary of results

There are no major setbacks and limitations to note regarding siting a land application system, by reference to AS 1547 (2017). Vertical and horizontal setback distances are required to be considered in line with Council guidelines and Australian Standards when locating the wastewater management system. Specific to the site, setbacks around the placement of the wastewater management system should consider:

- Potential access/egress and distance to overhead powerline easements.
- Minimum setback distance of 100m from surface water features including the Five Mile Creek.
- Existing and proposed future on-site developments.

The chemical analysis and physical testing conducted characterises the sites as having nil or slight limitations compared to the DEC (2004) guidelines (**Attachment E**), except for moderate limitations for cation exchange capacity in the topsoil that is inherent to the soil chemistry and texture; and pH, which may be ameliorated with the application of lime. As noted above, we also understand that there have been issues in the past on a nearby site.

In making the following recommendations, the plans prepared by SN Architects, dated 18 August 2023 have been referred to. The volume of wastewater produced from Stage 1 of the development (under a fully occupied scenario with 50% retail 50% hospitality) is estimated to be 7,500 litres per day. This volume is an estimate only and is to be confirmed by hydraulic analysis based on the final development design. The volume of wastewater produced from the proposed development has been estimated based on the following assumptions:

- Stage 1 development area made up of 252m^2 for the bakery/cafe (BD1) and 252m^2 restaurant (BD3) with a total trade of up to 500 customers per day (supplied by client).
- Retail having 250 customers per day with a five litres per person per day wastewater flow.
- Hospitality having 250 customers per day with a 25 litres per person per day wastewater flow.

Whilst we understand that the subject DA will relate only to Stage 1 works, there is an endorsed masterplan for the site which anticipates additional development to the south of the proposed works consisting of additional retail and food and drink offerings, as well as on site accommodation, and the potential for an RV park to the north.

Two options are considered for wastewater management being a pump out system and/or on-site disposal by irrigation.

1. A pump out system is recommended for wastewater management as the site is not connected to the sewer and the size of an on-site wastewater management system could hinder future development. The collection tank size should be based on the weekly wastewater volume and whether there is a standby pump incorporated into the design. It is also recommended that appropriate infrastructure is incorporated into the design to allow for the efficient monitoring and operation of the pump out system. Treatment for odour control should also be considered. The pump out system future proofs the site in the case of it being connected to the municipal sewer.

2. An Aerated Wastewater Treatment Systems (AWTS) could be considered as an option for wastewater treatment with land application via drip or low-pressure spray irrigation. The AWTS is preferred over conventional septic tanks and trench disposal as:

- The AWTS offers the highest level of treatment compared to conventional septic tanks.
- The irrigated drip or spray also offers a low application risk owing to the comparatively large irrigation area compared to trenches or beds, meaning nutrients and bacteria are not concentrated.
- Based on such the following land application system sizing using the design irrigation rate for weakly structured clay loam soil as presented in AS 1547 (2017):
    - The land application area is 3,581m^2.
    - The maximum application rate is 3.5mm/day over the available suitable land application area.
    - The water balance calculations can be seen in **Attachment F**.

In the case of the subject site and noting the anecdotal evidence of previous contamination issues resulting from an AWTS and the potential for future development as informed by the adopted masterplan, we recommend that the pump out system be pursued in relation to the proposed Stage 1 works. The area of the site which would be required to be designated to the drip or low-pressure spray irrigation would be significant and would hinder the future development potential at the site. We recommend a pump out system with at least 52,500 litres capacity be pursued.

If you have any queries about the contents of the letter format report, please contact the undersigned.

Yours sincerely

David McMahon CEnvP SC
BAppSc SA
GradDip WRM
MEnvMgmt
MALGA MEIANZ MSSA

Disclaimer

The information contained in this report has been extracted from sources believed to be reliable and accurate. DM McMahon Pty Ltd will not assume any responsibility for the misinterpretation of information supplied in this report. The accuracy and reliability of recommendations identified in this report need to be evaluated with due care according to individual circumstances. The results of the assessment undertaken are an overall representation of the conditions encountered. It should be noted that the recommendations and findings in this report are based solely upon the said site location and the ground level conditions at the time of testing. The results of the said investigations undertaken are an overall representation of the conditions encountered. The properties of the soil within the location may change due to variations in ground conditions outside of the tested area. The author has no control or liability over site variability that may warrant further investigation that may lead to significant design changes.

Notice of Copyright

Attachments

A. Location maps and proposed development plan

B. Investigation locations

C. Log sheets

D. Laboratory results

E. Soil characterisation

F. Water balance

Attachment A : *Location maps and proposed development plan*

37 Annie Pyers Drive Gundagai NSW 2722

Land Capability Assessment
Job No. 9298
Google Earth image 2023

Legend
Boundary

Five Mile Creek Rd
Hume Hwy
M31
M31
N
600 m
Google Earth
Image © 2023 CNES / Airbus

37 Annie Pyers Drive Gundagai NSW 2722

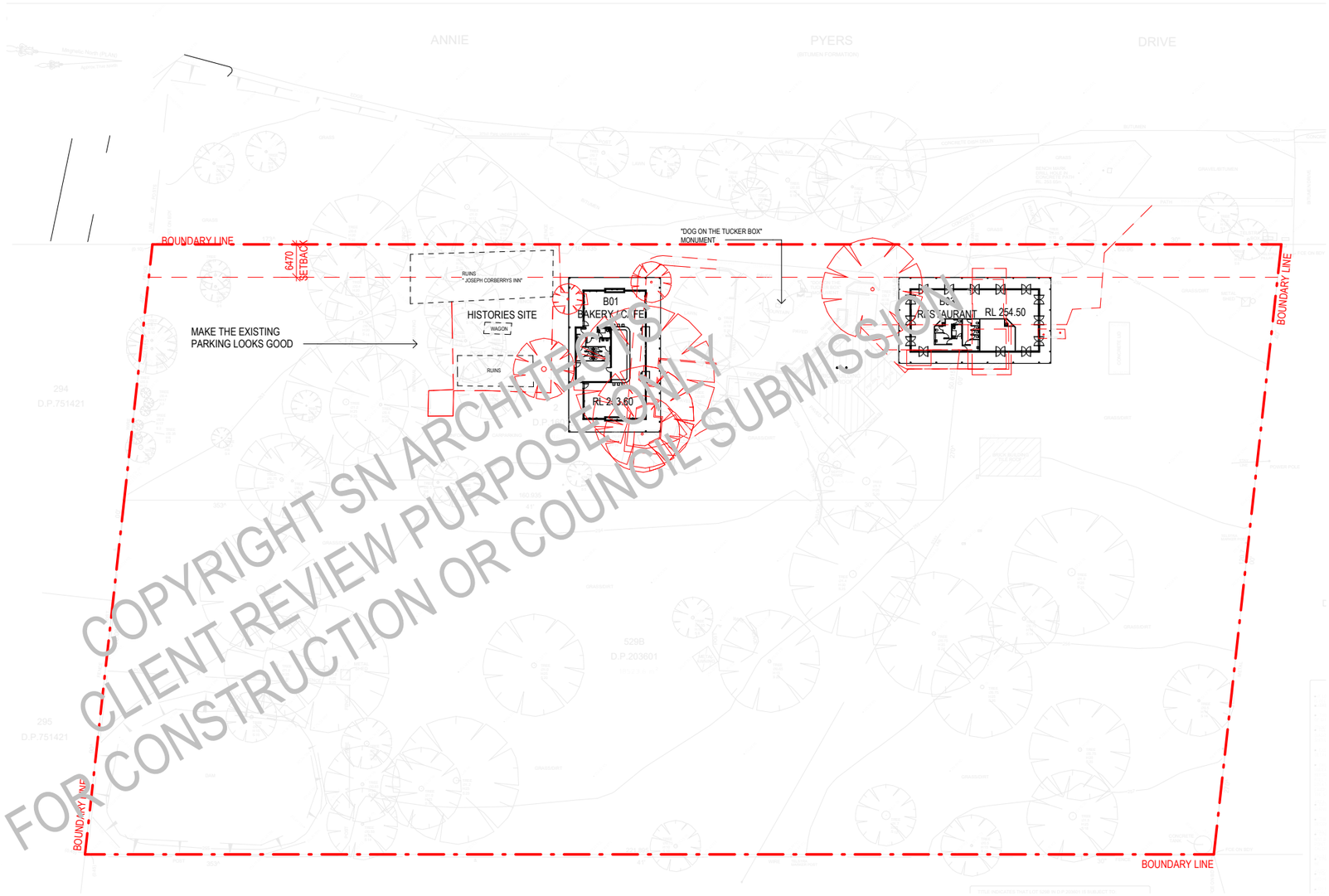
Land Capability Assessment
Job No. 9298
Google Earth image 2023

Legend
Boundary

M31
Burra Rd
Burra Rd
West St
Darbalara Rd
Darbalara Rd
N
3 km
Google Earth
Image © 2023 CNES / Airbus

DEMOLITION NOTES

- CAP OFF EXISTING PLUMBING AND ELECTRICAL WORKS AS NECESSARY BY CERTIFIED TRADESPERSON.
- MODIFIED BRICKWORK TO BE TOOTHED INTO EXISTING WHERE APPLICABLE AND CAVITY TO REMAIN CONTINUOUS AT ALL TIMES.
- EXISTING MATERIALS TO BE REUSED TO OWNERS DETAIL.
- MATERIALS REMOVED FROM SITE MUST BE DISPOSED OF AS PER COUNCIL REGULATIONS.
- INVESTIGATION SHOULD BE UNDERTAKEN BEFORE ALL WORKS THAT REQUIRES EXCAVATION.
-ALLOW TO CAREFULLY DEMOLISH/REMOVE/SALVAGE THE ITEMS SHOWN ON DRAWINGS IN ACCORDANCE WITH BUILDING CODES AND AUSTRALIAN STANDARDS AND AS REQUIRED FOR THE COMPLETION OF THE CONTRACT WORKS.
-ALLOW TO EXCAVATE ALL TRENCHES REQUIRED FOR NEW/RELOCATED UTILITY SERVICES (ELECTRICITY, WATER, GAS, SEWER, ETC
-ALLOW FOR ANY OTHER DEMOLITION AND EXCAVATION AS REQUIRED FOR THIS COMPLETION OF THE WORKS.
- CHECK THE STABILITY OR OTHERWISE OF STRUCTURES IN THE VICINITY OF THE DEMOLITION WORK. TAKE PRECAUTIONS TO PREVENT DAMAGE TO SUCH STRUCTURES.
- IF EXCAVATION IS REQUIRED BELOW THE LINE OF INFLUENCE OF AN EXISTING FOOTING, USE METHODS THAT MAINTAIN THE SUPPORT OF THE FOOTING AND ENSURE THAT THE STRUCTURE AND FINISHES SUPPORTED BY THE FOOTING ARE NOT DAMAGED.
- ARRANGE FOR DISCONNECTION, CUTTING, SEALING OFF, DIVERTING ETC. OF EXISTING SERVICES AS REQUIRED BY THE CONTRACT.
-PREVENT DAMAGE OR INTERFERENCE TO EXISTING SERVICES ABOVE AND BELOW GROUND. IMMEDIATELY RECTIFY ANY DAMAGE OR INTERFERENCE OF THESE SERVICES AND PROVIDE TEMPORARY SERVICES WHILST REPAIRS ARE BEING CARRIED OUT.
-SEEK APPROVAL FROM COUNCIL FOR REMOVING TREES (IF NOT EXEMPT)



1 STAGE 1 PROPOSED PLAN

1 : 1000

m 0 10 20 30 40

1:1000 at A3 1:500 at A1

LEGEND

PROPOSED

TO BE DEMOLISHED

N

Scale

ARCHITECTS

W www.snarchitects.com.au
E info@snarchitects.com.au
M 0405242821
A 1/98 Allen St, Leichhardt NSW 2040

REFERENCES

DRAWINGS TO BE READ IN CONJUNCTION WITH BUT NOT LIMITED TO ALL STRUCTURAL ENGINEERS, STORMWATER ENGINEERS, LANDSCAPE ARCHITECTS, AND OTHER ASSOCIATED PLANS & REPORTS .

REFER TO THE BASIX REPORT FOR ADDITIONAL REQUIREMENTS.

NOTES

ALL DIMENSIONS AND SETOUTS ARE TO BE VERIFIED ON SITE AND ALL OMISSIONS OR ANY DISCREPANCIES TO BE NOTIFIED. FIGURED DIMENSIONS TO BE USED AT ALL TIMES**DO NOT SCALE** MEASUREMENTS OFF DRAWINGS.

NOMINATED ARCHITECT: SOROOSH MOSHKSAR 11278

DRAWN	DESIGNED	CHECKED
SM	SM	SM

DRAWING SCALE	SHEET SIZE	PROJECT NUMBER
As indicated	A3	210804

DRAWING NUMBER
A 1105

DRAWING TITLE
STAGE 1 PROPOSED PLAN

PROJECT STAGE
PRELIMINARY

PROJECT DETAILS
Mixed used Development

DOG ON THE TUCKER BOX

CLIENT DETAILS
The DOTT Developments Pty Ltd

Rev.	Date	Description
P2	230810	PRELIMINARY
P1	230703	PRELIMINARY

Attachment B : *Investigation locations*

37 Annie Pyers Drive Gundagai NSW 2722

Land Capability Assessment
Job No. 9298
Google Earth image 2023

Legend

- Boundary
- Investigation locations

Attachment C : *Log sheets*

McMahon EARTH SCIENCE

Job No:	9298	**Landform:**	Footslope
Client:	The Dott Developments Pty Ltd	**Slope:**	Gently inclined
Site:	37 Annie Pyers Drive Gundagai	**Vegetation/Surface:**	Grass (mown)
Date:	11/05/2023	**Logged By:**	D. McMahon

Sampling Method: [x] Hand Excavated [x] Hand Auger [ ] Power Auger [ ] Machine Excavated Other:_____

Location	Depth (m)	Sample	Description	Comments	Co-ordinates MGA GDA94 z55
1	0-0.2	1/1	A Horizon - grey brown sandy clay loam, weak subangular blocky pedality, nil mottling, nil coarse fragments, nil segregations, well drained, abundant roots, gradual and smooth boundary to -	Field dispersion 6 (Emerson).	601275E 6126270N 261mAHD
	0.2-0.5	-	A2-Horizon - bleached grey sandy silty loam, weak granular pedality, nil mottling, nil coarse fragments , nil segregations, well drained, many roots, abrupt and smooth boundary to -	-	
	0.5-0.9	1/2	B-Horizon - yellow red medium clay, moderate subangular blocky pedality, nil mottling, few coarse fragments (siltstone) 2-6mm, nil segregations, imperfectly drained, common roots, diffuse boundary to -	Field dispersion 6 (Emerson).	
	0.9-1.2	-	C-Horizon - red yellow silty clay, moderate subangular blocky pedality, nil mottling, many coarse fragments (siltstone) 2-6mm, nil segregations, moderately-well drained, few roots, end of hole at 1.2m.	-	

McMahon EARTH SCIENCE

Job No:	9298	**Landform:**	Footslope
Client:	The Dott Developments Pty Ltd	**Slope:**	Very gently inclined
Site:	37 Annie Pyers Drive Gundagai	**Vegetation/Surface:**	Grass (mown)
Date:	11/05/2023	**Logged By:**	David McMahon

Sampling Method: [x] Hand Excavated [x] Hand Auger [ ] Power Auger [ ] Machine Excavated Other:_____

Location	Depth (m)	Sample	Description	Comments	Co-ordinates MGA GDA94 z55
2	0-0.15	-	A Horizon - grey brown silty clay loam, weak subangular blocky pedality, nil mottling, nil coarse fragments, nil segregations, well drained, abundant roots, gradual and smooth boundary to -	-	530386E 6103282N 260mAHD
	0.15-0.3	-	A2 Horizon - bleached (slightly) grey brown fine sandy clay loam, weak subangular blocky pedality, nil mottling, nill coarse fragments, nil segregations, well drained, common roots, abrupt and smooth boundary to -	-	
	0.3-0.6	-	B1 Horizon - yellow brown fine sandy clay loam, strong subangular blocky pedality, nil mottling, nil coarse fragments, nil segregations, moderately-well drained, common roots, abrupt and smooth boundary to -	-	
	0.6-1.2	-	B2-Horizon - yellow red medium clay, moderate subangular blocky pedality, nil mottling, few coarse fragments (siltstone) 2-6mm, nil segregations, imperfectly drained, common roots, end of hole at 1.2m.	-	

McMahon EARTH SCIENCE

Job No:	9298	**Landform:**	Footslope
Client:	The Dott Developments Pty Ltd	**Slope:**	Very gently inclined
Site:	37 Annie Pyers Drive Gundagai	**Vegetation/Surface:**	Grass (mown)
Date:	11/05/2023	**Logged By:**	David McMahon

Sampling Method: [x] Hand Excavated [x] Hand Auger [ ] Power Auger [ ] Machine Excavated Other:_____

Location	Depth (m)	Sample	Description	Comments	Co-ordinates MGA GDA94 z55
3	0-0.2	-	A Horizon - grey brown silty clay loam, weak subangular blocky pedality, nil mottling, nil coarse fragments, nil segregations, well drained, abundant roots, gradual and smooth boundary to -	-	601300E 6126345N 259mAHD
	0.2-0.5	-	A2 Horizon - bleached (slightly) grey brown fine sandy clay loam, weak subangular blocky pedality, nil mottling, nill coarse fragments, nil segregations, well drained, common roots, abrupt and smooth boundary to -	-	
	0.5-0.8	-	B1 Horizon - yellow brown fine sandy clay loam, strong subangular blocky pedality, nil mottling, nil coarse fragments, nil segregations, moderately-well drained, common roots, abrupt and smooth boundary to -	-	
	0.8-1.2	-	B2-Horizon - yellow red medium clay, moderate subangular blocky pedality, nil mottling, few coarse fragments (siltstone) 2-6mm, nil segregations, imperfectly drained, common roots, end of hole at 1.2m.	-	

McMahon EARTH SCIENCE

Job No:	9298	**Landform:**	Flat
Client:	The Dott Developments Pty Ltd	**Slope:**	Level
Site:	37 Annie Pyers Drive Gundagai	**Vegetation/Surface:**	Grass (mown)
Date:	11/05/2023	**Logged By:**	David McMahon

Sampling Method: [x] Hand Excavated [x] Hand Auger [ ] Power Auger [ ] Machine Excavated Other:_____

Location	Depth (m)	Sample	Description	Comments	Co-ordinates MGA GDA94 z55
4	0-0.5	-	A Horizon - dark brown clay loam, moderate subangular blocky pedality, nil mottling, nil coarse fragments, nil segregations, well drained, abundant roots, gradual and smooth boundary to -	Organic soil. Field dispersion 5 (Emerson).	601353E 6126383N 257mAHD
	0.5-1.2	-	B/C Horizon - drak grey brown light clay, strong subangular blocky pedality, nil mottling, nil coarse fragments, nil segregations, well drained, abundant roots, end of hole at 1.2m.	Organic soil. Some sand seams at depth. Field dispersion 4 (Emerson).	

Attachment D : *Laboratory results*

Analysis Results

CSBP Soil and Plant Laboratory

98688
DM McMahon Pty Ltd

		Lab No	7GS23050	7GS23051	7GS23052	7GS23053
		Name	9298 1/1	9298 1/2	9298 4/1	9298 4/2
		Code	17/05/23	17/05/23	17/05/23	17/05/23
		Customer	DM McMahon Pty Ltd	DM McMahon Pty Ltd	DM McMahon Pty Ltd	DM McMahon Pty Ltd
		Depth	0-10	0-10	0-10	0-10
NH4OAc exch Calcium	meq/100g		3.94	10.14	12.60	18.45
NH4OAc exch Magnesium	meq/100g		1.10	5.91	4.52	16.30
NH4OAc exch Potassium	meq/100g		0.59	0.67	1.37	1.13
NH4OAc exch Sodium	meq/100g		0.03	0.16	0.28	3.04
Conductivity	dS/m		0.029	0.027	0.129	0.533
pH Level (CaCl2)			5.5	5.9	5.9	6.6
pH Level (H2O)			6.6	7.2	6.9	7.6
Ca:Mg NH4OAc exch.			3.57	1.71	2.79	1.13
ECEC	meq/100g		5.7	16.9	18.8	38.9
K:Mg NH4OAc exch.			0.53	0.11	0.30	0.07

CSBP Lab. Extract Value.

Attachment E : *Soil characterisation*

37 Annie Pyers Drive Gundagai NSW
Land Capability Assessment Soil Characteristics for Irrigation area

		Limitation			
Property	**Result**	**Nil or Slight**	**Moderate**	**Severe**[1]	**Restrictive Feature**
Exchangeable sodium percentage 0-40cm	**0.5 – 1.5**	0–5	5–10[2]	> 10	Structural degradation and waterlogging
Exchangeable sodium percentage (40-100 cm)	**1.0 – 7.8**	< 10	>10	_	Structural degradation and waterlogging
Salinity measured as electrical conductivity (ECe) (dS/m at 0-70cm)	**0.029 - 0.129**	< 2	2–4	> 4[3]	Excess salt may restrict plant growth
Salinity measured as electrical conductivity (ECe) (dS/m at 70-100cm)	**0.027 - 0.533**	< 4	4–8	> 8[3]	Excess salt may restrict plant growth, potential seasonal groundwater rise
Depth to top of seasonal high water table (metres)	**>1.2m**	> 3[4]	0.5–3[4]	< 0.5	Poor aeration, restricts plant growth, risk to groundwater[5]
Depth to bedrock or hardpan (metres)	**>1.2m**	> 1	0.5–1	< 0.5	Restricts plant growth, excess runoff, waterlogging
Saturated hydraulic conductivity (Ks, mm/h, 0-100 cm)	**20-70**	20–80	5–20[6] or >80[6]	<5	Excess runoff, waterlogging, poor infiltration
Available water capacity (AWC, mm/m)	**120-210**	>100	<100 [6]	-	Little plant-available water in reserve, risk to groundwater
Soil pH CaCl2 (surface layer)	**5.5 – 5.9**	>6-7.5	3.5-6.0	<3.5	Reduces optimum plant growth
Effective cation exchange capacity (ECEC, cmol (+)/kg, average 0–40 cm)	**5.7 - 18.8**	>15	3-15[8]	<3	Unable to hold plant nutrients
Emerson aggregate test (0–100cm)	**4, 5 & 6**	4, 5, 6, 7, 8	2, 3	1	Poor structure
Phosphorus (P) sorption (kg/ha at total 0–100 cm)	**-**	high[9]	moderate[9]	Low	Unable to immobilise any excess phosphorus

Source: Based on Hardie and Hird (1998), See also NSW Department of Primary Industries (2004).

Notes:
1. Sites with these properties are unlikely to be suitable for irrigation of some or all effluent products.
2. Application of gypsum or lime may be required to maintain long-term site sustainability.
3. Some high EC soils containing calcium 'salts' are not necessarily considered 'severe'.
4. Where unable to excavate to 3m, local knowledge and absence of indications of water table to the depth of sampling (1m) should be used.
5. Criteria are set primarily for assessing site suitability for plant growth. Presence of a shallow soil water table may indicate soil conditions that favour movement of nutrients and contaminants into groundwater. In such cases, careful consideration should be given to quality and potential impacts on groundwater.
6. Careful irrigation scheduling and good irrigation practices will be required to maintain site sustainability.
7. Soil pH may need to be increased to improve plant growth. Where effluent is alkaline or lime is available, opportunities exist to raise pH. If acid sulfate soil is present, site-specific specialist advice should be obtained.
8. Soil may become more sodic with effluent irrigation. In some cases, however, this soil property may be ameliorated with addition of a calcium source.
9. Soils with medium to high phosphorus sorption capacity can adsorb excess phosphorus not taken up by plants. The effectiveness of this depends not only on the sorption capacity but also, the depth and permeability of the soil.

Attachment F : *Water balance*

Water Balance

Irrigation area sizing using Nominated Area Water Balance & Storage Calculations

Site Address:	**37 Annie Pyers Drive Gundagai NSW 2722**		
Date:	May 2023	**Assessor:**	David McMahon

INPUT DATA

Design Wastewater Flow	Q	7,500	L/day	Based on assumptions and expected wastewater generation as outlined in report 8903.
Design Irrigation Rate	DIR	3.5	mm/day	Based on soil texture class/permeability and derived from Table 5.2 of AS 1547:2012
Nominated Land Application Area	L	3581	m^2	[1]
Crop Factor	C	0.8-1.0	unitless	Estimates evapotranspiration as a fraction of pan evaporation; varies with season and crop type[2]
Rainfall Runoff Factor	RF	1	unitless	Proportion of rainfall that remains onsite and infiltrates, allowing for any runoff
Mean Monthly Rainfall Data	Gundagai Data Drill (-35.00, 148.10)			SILO Data Drill datasets (1889-2023) are constructed from observational records provided by the Bureau of Meteorology. SILO interpolates the raw data, which may contain missing values, to derive datasets which are both spatially and temporally complete.
Mean Monthly Pan Evaporation Data	Gundagai Data Drill (-35.00, 148.10)			

Parameter	Symbol	Formula	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Days in month	D		days	31	28	31	30	31	30	31	31	30	31	30	31	**365**
Rainfall	R		mm/month	54.8	43.7	48.8	51.2	57.4	63.8	71.3	69.3	62.3	69.2	58.4	49.3	**699.4**
Evaporation	E		mm/month	234.4	185.9	152.2	87.2	48.8	31.7	34.7	51.5	78.9	124.9	167.3	216.8	**1414.4**
Crop Factor	C		unitless	1.00	1.00	0.90	0.90	0.80	0.80	0.80	0.80	0.80	0.90	0.90	1.00	
OUTPUTS																
Evapotranspiration	ET	ExC	mm/month	234	186	137	78	39	25	28	41	63	112	151	217	**1312.1**
Percolation	B	DIRxD	mm/month	108.5	98	108.5	105.0	108.5	105.0	108.5	108.5	105.0	108.5	105.0	108.5	**1277.5**
Outputs		ET+B	mm/month	342.9	283.9	245.5	183.4	147.6	130.4	136.2	149.7	168.2	221.0	255.6	325.3	**2589.6**
INPUTS																
Retained Rainfall	RR	RxRF	mm/month	54.8	43.7	48.8	51.2	57.4	63.8	71.3	69.3	62.3	69.2	58.4	49.3	**699.4**
Applied Effluent	W	(QxD)/L	mm/month	64.9	58.6	64.9	62.8	64.9	62.8	64.9	64.9	62.8	64.9	62.8	64.9	**764.5**
Inputs		RR+W	mm/month	119.7	102.3	113.7	114.1	122.3	126.6	136.2	134.2	125.2	134.1	121.2	114.2	**1463.8**
STORAGE CALCULATION																
Storage remaining from previous month			mm/month	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Storage for the month	S	(RR+W)-(ET+B)	mm/month	-223.2	-181.6	-131.8	-69.4	-25.2	-3.8	0.0	-15.5	-43.0	-86.8	-134.3	-211.1	
Cumulative Storage	M		mm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Maximum Storage for Nominated Area	N		mm	**0.00**												
	V	NxL	L	**0**												
LAND AREA REQUIRED FOR ZERO STORAGE			m^2	807	874	1182	1702	2579	3378	3580	2892	2126	1532	1141	842	

MINIMUM AREA REQUIRED FOR ZERO STORAGE: **3581.0** m^2